

Department of Energy

§ 431.106

Hot Water Supply Boilers, and Unfired Hot Water Storage Tanks,” Docket No. EE-RM/TP-99-480, Forrestal Building, 1000 Independence Avenue, SW., Washington, DC 20585.

(2) *Obtaining copies of Standards.* Anyone can purchase a copy of the standard incorporated by reference from Global Engineering Documents, 15 Inverness Way West, Englewood, CO 80112, or <http://global.ihs.com/>, or <http://webstore.ansi.org/ansidocstore/>.

(d) *Reference standards*—(1) *General.* The standards listed in this paragraph are referred to in the Department test procedures in this subpart, but they are not incorporated by reference. These sources are given here for information and guidance.

(2) *List of References.* (i) ASTM Standard Test Method C518-91, “Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.”

(ii) ASTM Standard Test Method C177-97, “Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties

by Means of the Guarded-Hot-Plate Apparatus.”

(iii) ASTM Standard Test Method D2156-80, “Method for Smoke Density in Flue Gases from Burning Distillate Fuels.”

§ 431.106 Uniform test method for the measurement of energy efficiency of commercial water heaters and hot water supply boilers (other than commercial heat pump water heaters).

(a) *Scope.* This section covers the test procedures you must follow if, pursuant to EPCA, you are measuring the thermal efficiency or standby loss, or both, of a storage or instantaneous water heater or hot water supply boiler (other than a commercial heat pump water heater).

(b) *Testing and Calculations.* Determine the energy efficiency of each covered product by conducting the test procedure(s), set forth in the two rightmost columns of the following table, that apply to the energy efficiency descriptor(s) for that product:

Product	Energy efficiency descriptor	Use test setup, equipment and procedures in subsection labeled “Method of Test” of	With these additional stipulations
Gas-fired Storage and Instantaneous Water Heaters and Hot Water Supply Boilers*.	Thermal Efficiency	ANSI Z21.10.3–1998, § 2.9**.	<p>A. For all products, the duration of the standby loss test shall be until whichever of the following occurs first after you begin to measure the fuel and/or electric consumption: (1) The first cutout after 24 hours or (2) 48 hours, if the water heater is not in the heating mode at that time.</p> <p>B. For oil and gas products, the standby loss in Btu per hour must be calculated as follows: $SL \text{ (Btu per hour)} = S \text{ (\% per hour)} \times 8.25 \text{ (Btu/gal-F)} \times \text{Measured Volume (gal)} \times 70 \text{ (degrees F)}$.</p> <p>C. For oil-fired products, apply the following in conducting the thermal efficiency and standby loss tests:</p> <p>(1) Venting Requirements—Connect a vertical length of flue pipe to the flue gas outlet of sufficient height so as to meet the minimum draft specified by the manufacturer.</p> <p>(2) Oil Supply—Adjust the burner rate so that: (a) The hourly Btu input rate lies within ± 2 percent of the manufacturer’s specified input rate, (b) the CO_2 reading shows the value specified by the manufacturer, (c) smoke in the flue does not exceed No. 1 smoke as measured by the procedure in ASTM-D-2156-80, and (d) fuel pump pressure lies within ± 10 percent of manufacturer’s specifications.</p> <p>D. For electric products, apply the following in conducting the standby loss test:</p> <p>(1) Assume that the thermal efficiency (Et) of electric water heaters with immersed heating elements is 98 percent.</p> <p>(2) Maintain the electrical supply voltage to within ± 5 percent of the center of the voltage range specified on the water heater nameplate.</p>
	Standby Loss	ANSI Z21.10.3–1998, § 2.10**.	
Oil-fired Storage and Instantaneous Water Heaters and Hot Water Supply Boilers*.	Thermal Efficiency	ANSI Z21.10.3–1998, § 2.9**.	<p>A. For all products, the duration of the standby loss test shall be until whichever of the following occurs first after you begin to measure the fuel and/or electric consumption: (1) The first cutout after 24 hours or (2) 48 hours, if the water heater is not in the heating mode at that time.</p> <p>B. For oil and gas products, the standby loss in Btu per hour must be calculated as follows: $SL \text{ (Btu per hour)} = S \text{ (\% per hour)} \times 8.25 \text{ (Btu/gal-F)} \times \text{Measured Volume (gal)} \times 70 \text{ (degrees F)}$.</p> <p>C. For oil-fired products, apply the following in conducting the thermal efficiency and standby loss tests:</p> <p>(1) Venting Requirements—Connect a vertical length of flue pipe to the flue gas outlet of sufficient height so as to meet the minimum draft specified by the manufacturer.</p> <p>(2) Oil Supply—Adjust the burner rate so that: (a) The hourly Btu input rate lies within ± 2 percent of the manufacturer’s specified input rate, (b) the CO_2 reading shows the value specified by the manufacturer, (c) smoke in the flue does not exceed No. 1 smoke as measured by the procedure in ASTM-D-2156-80, and (d) fuel pump pressure lies within ± 10 percent of manufacturer’s specifications.</p> <p>D. For electric products, apply the following in conducting the standby loss test:</p> <p>(1) Assume that the thermal efficiency (Et) of electric water heaters with immersed heating elements is 98 percent.</p> <p>(2) Maintain the electrical supply voltage to within ± 5 percent of the center of the voltage range specified on the water heater nameplate.</p>
	Standby Loss	ANSI Z21.10.3–1998, § 2.10**.	

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10 CFR Ch. II (1–1–09 Edition)

Product	Energy efficiency descriptor	Use test setup, equipment and procedures in subsection labeled "Method of Test" of	With these additional stipulations
Electric Storage and Instantaneous Water Heaters.	Standby Loss	ANSI Z21.10.3–1998, § 2.10**.	(3) If the set up includes multiple adjustable thermostats, set the highest one first to yield a maximum water temperature in the specified range as measured by the topmost tank thermocouple. Then set the lower thermostat(s) to yield a maximum mean tank temperature within the specified range.

*As to hot water supply boilers with a capacity of less than 10 gallons, these test methods become mandatory on October 21, 2005. Prior to that time, you may use for these products either (1) these test methods if you rate the product for thermal efficiency, or (2) the test methods in Subpart E if you rate the product for combustion efficiency as a commercial packaged boiler.

**Incorporated by reference, see § 431.105.

§ 431.107 Uniform test method for the measurement of energy efficiency of commercial heat pump water heaters. [Reserved]

ENERGY CONSERVATION STANDARDS

§ 431.110 Energy conservation standards and their effective dates.

Each commercial storage water heater, instantaneous water heater, unfired hot water storage tank and hot water supply boiler¹ must meet the applicable energy conservation standard level(s) as follows:

Product	Size	Energy conservation standard ^a (products manufactured on and after October 29, 2003) ^b	
		Minimum thermal efficiency	Maximum standby loss ^c
Electric storage water heaters.	All	N/A	$0.30 + 27/V_m$ (%/hr)
Gas-fired storage water heaters.	≤155,000 Btu/hr ...	80%	$Q/800 + 110(V_r)^{1/2}$ (Btu/hr)
	>155,000 Btu/hr ...	80%	$Q/800 + 110(V_r)^{1/2}$ (Btu/hr)
Oil-fired storage water heaters.	≤155,000 Btu/hr ...	78%	$Q/800 + 110(V_r)^{1/2}$ (Btu/hr)
	>155,000 Btu/hr ...	78%	$Q/800 + 110(V_r)^{1/2}$ (Btu/hr)
Gas-fired instantaneous water heaters and hot water supply boilers.	<10 gal	80%	N/A
	≥10 gal	80%	$Q/800 + 110(V_r)^{1/2}$ (Btu/hr)
Oil-fired instantaneous water heaters and hot water supply boilers.	<10 gal	80%	N/A
	≥10 gal	78%	$Q/800 + 110(V_r)^{1/2}$ (Btu/hr)
Product	Size	Minimum thermal insulation	
Unfired hot water storage tank.	All	R–12.5	

^a V_m is the measured storage volume and V_r is the rated volume, both in gallons. Q is the nameplate input rate in Btu/hr.

^b For hot water supply boilers with a capacity of less than 10 gallons: (1) the standards are mandatory for products manufactured on and after October 21, 2005, and (2) products manufactured prior to that date, and on or after October 23, 2003, must meet either the standards listed in this table or the applicable standards in Subpart E of this Part for a “commercial packaged boiler.”

^c Water heaters and hot water supply boilers having more than 140 gallons of storage capacity need not meet the standby loss requirement if (1) the tank surface area is thermally insulated to R–12.5 or more, (2) a standing pilot light is not used and (3) for gas or oil-fired storage water heaters, they have a fire damper or fan assisted combustion.

¹ Any packaged boiler that provides service water, that meets the definition of “commercial packaged boiler” in subpart E of this part, but does not meet the definition of “hot water supply boiler” in subpart G, must meet the requirements that apply to it under subpart E.